

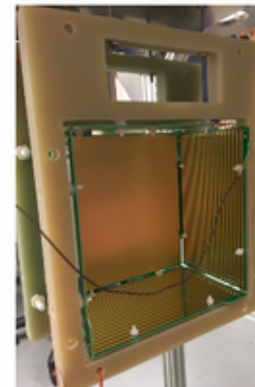
Small R&D Cryogenic Setups in ND-LAr Consortium

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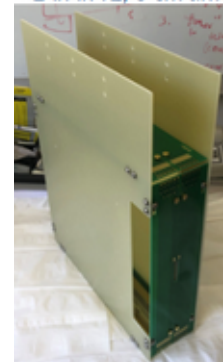
Pixel Plane Prototyping @ LBNL

- Purpose: development/testing of prototype pixel anode tiles
 - Used to guide design of pixelated charge readout system
 - Achievements: First operation of LArPix tiles in TPC (both v1, v2 ASICs)
- Cryo Operations: 2018 – now
 - Details:
 - LAr capacity: 100 liters
 - Single-shot system (no recirculation/cooling)
 - LBNL-designed LAr purifier
 - ~4 hr cooldown and fill, ~12 hr operation
 - Monitor pressure, temp, level, purity
 - Operation: Few times per year
 - Built from spare parts, scavenged equipment, pocket change, no engineers

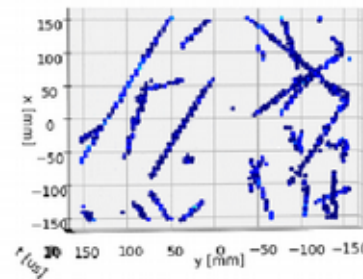
Pixel Test TPC
LArPix-v1, 10-cm drift



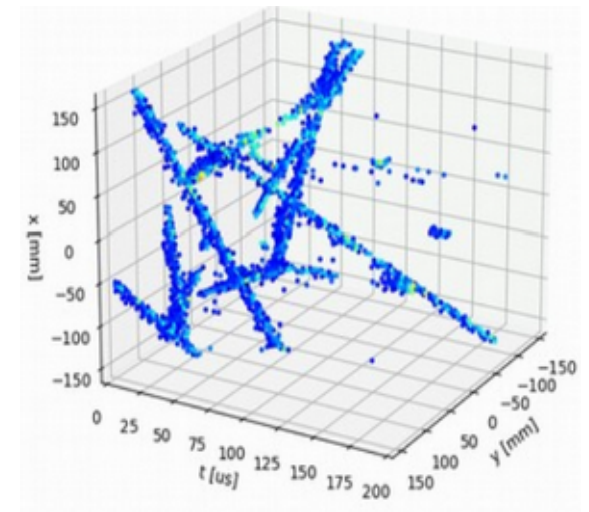
QC LArTPC
LArPix-v2, 3-cm drift



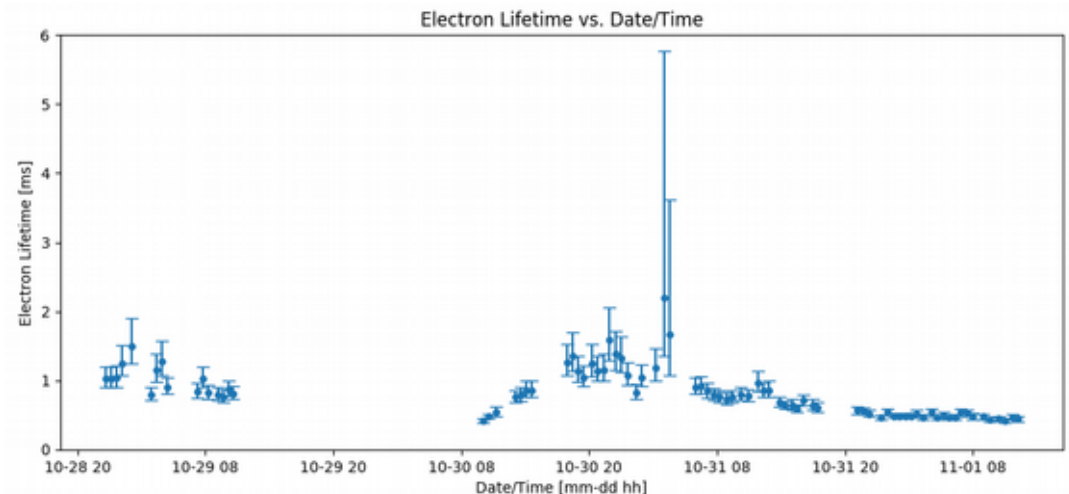
3D images of cosmic rays in QC LArTPC, 25 events overlaid



Integration Demonstration @ Bern

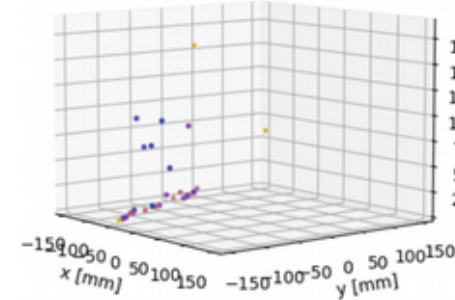
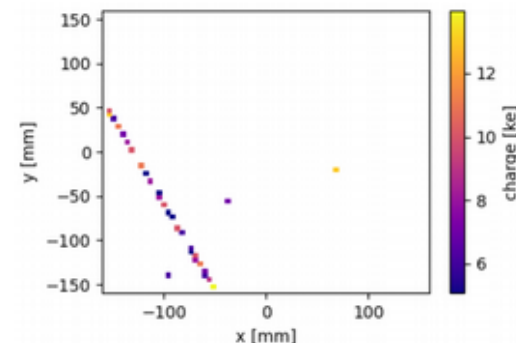


- Covered by Igor already
- Successful demonstration of integrating ND-LAr charge and light detectors (Oct. 2020)
- LAr cooling/purification system of 2x2 demonstrator
 - High e. lifetime: $> 500 \mu\text{s}$



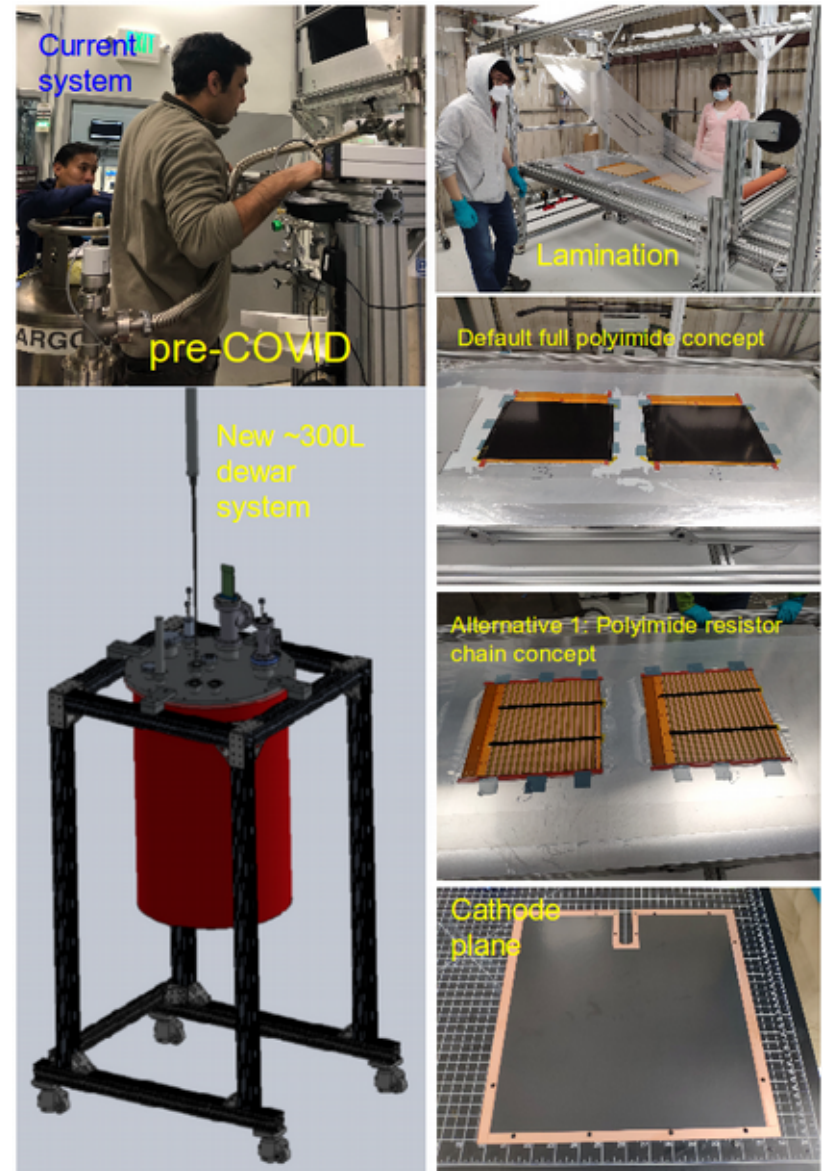
R&D/Testing @ CSU

- ~600L cryostat for operation of SingleCube setup @ CSU
 - Uses single-pass LAr filtration
 - LAr in ~200L “bucket” w/ GAr outside
 - Component characterization
 - R&D for hardware calibration systems
 - Test of alternative design options
- First operation in February 2021
 - First TPC tracks observed
 - Currently improving purity by regenerating LAr filter, run next month
 - Include light detector in future runs
- Also ~1900L cryostat @ CSU Foothills campus
 - Test of full 2x2 module mechanical mock-up in LN2 in March 2020
 - Check of CTE-related issues at cryogenic temperatures



Field Cage Prototyping @ SLAC

- Testing 2-3 alternative field cage designs in “SingleCube” format
 - Same HV feedthrough/cathode
- Enlarged version of existing dewar
 - Cooling delivered by LZ thermosyphon system
- Status:
 - Key components ordered and arriving soon
 - Vessel/lid arriving later this month from Cryofab
 - LArPix received from LBNL
 - Cathode lamination complete
 - Final round of lamination this week
- Plan:
 - Operate each field cage in succession over next several months
 - Projected finish at end CY21



QA/QC for Pixel Planes @ UTA

- 540L cryostat w/ associated vacuum, LAr purification system
 - Recently added 16 foot, 1 Ton crane in new 2500 sq. foot lab space
 - Current capacity can test 20 LArPix tiles per week in dedicated QC TPC's (5 cm drift)
 - Can upgrade the capacity to 40 tiles/week
- Mobile dedicated purity monitor to assess purification prior to each fill
- Two other small scale purified LAr cryostats available for testing / R&D
 - 110L pure LAr cryostat with outer open liquid argon bath
 - 70L cryostat with liter pure LAr cryostat with outer open liquid argon bath

